Report Title:

PHASE II CALDERON PROCESS TO PRODUCE DIRECT REDUCED IRON RESEARCH AND DEVELOPMENT PROJECT

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DISCLAIMER

QUARTERLY TECHNICAL PROGRESS REPORT

PHASE II CALDERON PROCESS TO PRODUCE DIRECT REDUCED IRON RESEARCH AND DEVELOPMENT PROJECT

CALDERON ENERGY COMPANY
COOPERATIVE AGREEMENT NO. DE-FC22-95PC92638

Reporting Period: 01-01-07 to 03-31-07

Date of Report: 4-30-07

Phase II Award Date: 6-23-00 Anticipated Completion Date: 12-03-07

Total Project: $14,732,316.00 Total DOE Share This Action: $6,457,000.00

Contracting Officer's Representative (COR): John Stipanovich

Project Director: Albert Calderon

Assistant Project Director: Reina Calderon

Abstract

This project was initially targeted to the making of coke for blast furnaces by using proprietary technology of Calderon in a phased approach, and Phase 1 was successfully completed. The project was then re-directed to the making of iron units. In 2000, U.S. Steel teamed up with Calderon for a joint effort to produce directly reduced iron with the potential of converting it into molten iron or steel consistent with the Roadmap recommendations of 1998 prepared by the Steel Industry in cooperation with the Department of Energy by using iron ore

concentrate and coal as raw materials, both materials being appreciably lower in cost than using iron pellets, briquettes, sinter and coke.

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Executive Summary

The commercialization path of the Calderon technology for making a feedstock for steelmaking with assistance from DOE initially focused on making coke, and work was done which proved that the Calderon technology is capable of making good coke for hard driving blast furnaces. U.S. Steel which participated in such demonstration felt that the Calderon technology would be more meaningful in lowering the costs of making steel by adapting it to the making of iron—thus obviating the need for coke.

U.S. Steel and Calderon teamed up to jointly work together to demonstrate that the Calderon technology will produce in a closed system iron units from iron concentrate (ore) and coal competitively by eliminating pelletizing, sintering, coking and blast furnace operation. If such process steps could be eliminated, a huge reduction in polluting emissions and greenhouse gases (including CO_2) relating to steelmaking would ensue. Such reduction will restructure the steel industry away from the very energy intensive steelmaking steps currently practiced and drastically reduce costs of making steel.

The development of a technology to lower U.S. steelmaking costs and become globally competitive is a priority of major importance. Therefore, the development work which Calderon is conducting presently under this Agreement with the U.S. Department of Energy becomes more crucial than ever.

The work performed during the 1st Quarter of 2007, which the present Progress Report covers, was advanced to the construction and installation of a new charger to accommodate the oxygen lance to be inserted from the charging end in order to overcome the heat losses occurring at the discharging end of the reactor. This new charger was almost completely de-bugged and placed into preliminary operation. Longer lances were required to be made to accommodate the new charger. An agreement was reached with Altos Hornos of Mexico (AHMSA) wherein their ore and their coal would be tested, for which they would pay for such tests.

Construction and Start-Up

In preparation for the installation of the new charger (see photograph, Exhibit 1), changes had to be made on the charging side of the reactor. These changes included structural, mechanical, electrical, piping and controls. This work was completed during the Quarter, except for the programming of the controls, which is in progress.

From January 24th through February 16th, 14 short tests (one per day) were conducted for de-bugging and also instituting a new lance practice using manual controls.

Experimental Work

The experimental test runs conducted during the remainder of the Quarter were preliminary tests for Altos Hornos of Mexico (AHMSA) based on terms reached on February 13, 2007; see Exhibit 2. Table 1 illustrates these tests.

Table 1

Test Run #	Date 2007	Length in Hours	No. of Pushes	Company
I-220	2/19 thru 2/21	58 hrs. : 00 min.	668	AHMSA
I-221	2/27 thru 3/01	49 hrs. : 50 min.	548	AHMSA
I-222	3/6	14 hrs. : 40 min.	183	AHMSA
I-223	3/7	15 hrs. : 30 min.	179	AHMSA
I-224	3/8	7 hrs. : 30 min.	94	AHMSA
I-225	3/9	18 hrs. : 20 min.	275	AHMSA
I-226	3/12 thru 3/15	83 hrs. : 35 min.	953	AHMSA
I-227	3/20 thru 3/21	35 hrs. : 30 min.	423	AHMSA
I-228	3/28	9 hrs. : 00	118	AHMSA

Results and Discussion

The criteria for the above-listed test runs were based on three factors: (1) A test run of 72 hours at reasonably steady state; (2) Minimum number of pusher stalls, preferably none; and (3) the number of grinds above 19 out of 24 to determine quality of the iron/carbon material produced.

In Test Run I-220 there were 27 pusher stalls, while 18 grinds were above 19 out of 24, and the length of Run was 58 hours. Such a large number of stalls was unacceptable.

In Test Run I-221 there were 14 pusher stalls, while 15 grinds were above 19 out of 24, and the length of the Run was about 50 hours. The number of stalls was unacceptable.

In Test Run I-222 there were no pusher stalls, but all material grinds were under 19 out of 24, and the length of the Run was about 15 hours. The quality of the material was unacceptable.

In Test Run I-223 there were no pusher stalls, while 5 grinds were above 19 out of 24, and the length of the Run was only 15½ hours. The unit was forced to

be shut down because of a mechanical malfunction.

In Test Run I-224 there was one pusher stall, while no grinds were above 19 out of 24. The length of the Run was 7½ hours, but the unit was forced to be shut down because of water leak in the reactor.

In Test Run I-225 there were 8 stalls, while 2 grinds were above 19 out of 24. The unit was forced to be shut down because of excessive stalling.

In Test Run I-226 there were 21 pusher stalls, and 22 grinds were above 19 out of 24; the Run was continued despite the excessive stalls. Length of Run was about 84 hours.

In Test Run I-227 there were 2 pusher stalls, while 16 grinds were above 19 out of 24, and the length of the Run was interrupted because of hydraulic pump failure. A new pump was ordered.

In Test Run I-228 there were 4 pusher stalls, while no samples were taken by virtue that the unit was shut down prior to reaching steady state. The length of the Run was only 9 hours; pushing pressures were beyond the capability of the hydraulic pump.

In analyzing the above results with respect to operating the unit with the objective of running for 72 hours at reasonably steady state which is the target for acceptance, it is to be noted that only Test Run I-226 which lasted 83 hrs : 30 min. was conducted long enough to qualify as to the length of the test and also to the number of grinds, but stalling 21 times was unacceptable.

Effort has been expended to understand the cause of the excessive stalling when comparing to previous tests in 2006 when the lance was inserted from the discharge end of the reactor while using U. S. Steel coal and ore. The coal from AHMSA possesses 14% ash, and it is surmised that the cause for the excessive stalling might be contributed by the high ash content of the AHMSA coal. The stalling problem may not be the ash, but possibly the start-up procedure which includes the early injection of the oxygen at near full capacity before the thermal soaking of the refractory lining takes place. Further, the configuration of the number of holes in the nozzle could be a factor which can cause melting within the reactor, or the gangue material in AHMSA's ore.

Conclusion

It is evident from the Test Runs conducted that injecting the oxygen from the charging end using a new ore and a new coal has introduced new conditions which

had not been experienced previously. However, several positive results were observed which included:

(1) the capability to reach and maintain higher temperatures more rapidly than before;

(2) evidence that the lance tip through which the oxygen is injected retains its shape during the Runs, which eliminates the need to withdraw the lance every hour to clean its tip;

(3) cooling water through the lance greatly is reduced;

(4) potential to avoid melting at the discharge end of the reactor;

(5) the apron at the discharge end of the elbow remains clean; and

(6) the potential of extending refractory life of the Reactor.

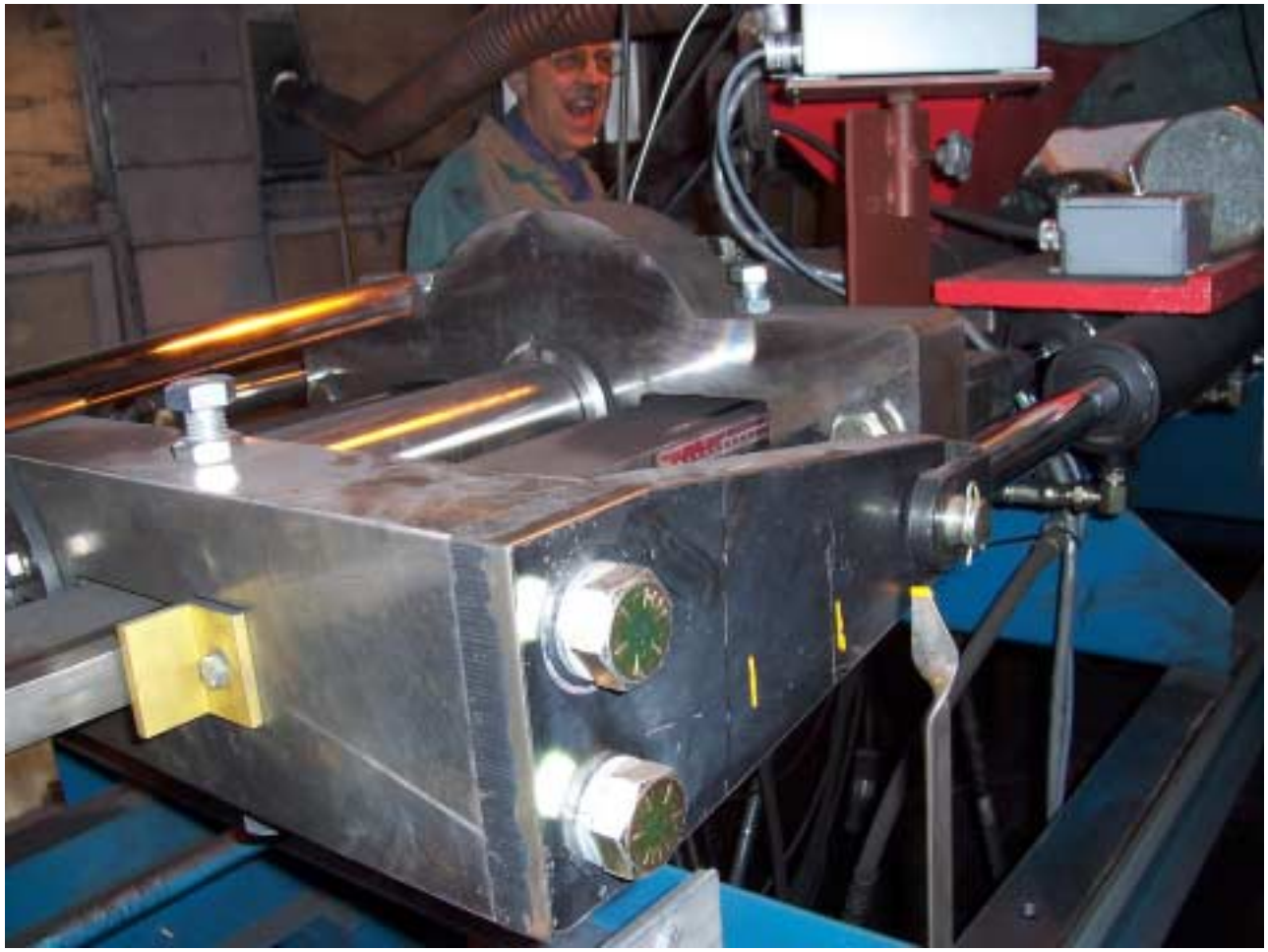
It is the intention to focus on the cause of the excessive stalling and overcoming such a problem during the forthcoming quarter.

References – Not Applicable

The work performed in this quarter which the report covers was original work. No reference material was relied upon for the work.

Submitted by:

Albert Calderon
Project Director



NEW CHARGER

Exhibit 1

Patty Ballard

From: "Patty Ballard" <CalBook@bghost.net>
To: "Gerardo Garcia Franco" <ggarciaf@gan.com.mx>
Sent: Tuesday, February 13, 2007 10:55 AM
Attach: Revised AHMSA Test.doc
Subject: Re: Calderon Energy Company

Dear Gerardo:

In response to your e-mail of February 9, 2007, we have revised the test program to correspond to the lump fee of $200,000. We have started de-bugging the new charger and discovered that we pick-up temperature much faster with the lance being introduced from the charging end.

Please let me know if the Revised Program which is attached meets your approval; we will submit a quotation consistent with the sum approved by Mr. Ancira.

Regards,

Albert Calderon

---- Original Message ----
From: Gerardo Garcia Franco
To: Patty Ballard
Cc: Armando Ferriz Dominguez
Sent: Friday, February 09, 2007 6:12 PM
Subject: RE: Calderon Energy Company

Alberto:
Mr. Ferriz said that instruction of Mr. Ancira was clear; the total lump fee possible to pay for the new test program is $200,000 USD. With this budget limit, we agree that it's required to modify the test plan but we must assure that results obtained will give us enough information to evaluate the feasibility to process AHMSA´s raw materials.
Regards... GGF

-----Mensaje original-----
De: Patty Ballard [mailto:calbook@bghost.net]
Enviado el: Viernes, 09 de Febrero de 2007 12:51 p.m.
Para: ggarciaf@gan.com.mx
Asunto: Calderon Energy Company

Dear Gerardo:

I have talked to my men about changes to the Test Plan to be consistent with the limited

funding of $200,000 set by Mr. Ancira. Both AHMSA and Calderon hope that the coming tests will produce the desired results from your ore and coal.

The Test Plan submitted to AHMSA was our best effort to conceive a plan which has a good chance to reach such successful results. In as much as it is the interest of both parties to succeed, we would like to make an offer to AHMSA which consists of the following:

The overall cost submitted is: $442,500.

The limit set by Mr. Ancira is: $200,000.

The shortfall is: $242,500.

Do you think if we equally split this shortfall between AHMSA and Calderon that AMSA would agree to increase the sum of $200,000 by $121,250 as AHMSA's share (amounting to $321,250) and we would pick up the balance? This will enable us to proceed with the Test Plan as submitted. Please take this offer to Armando and maybe Mr. Ancira will reconsider his position.

I would like to take this opportunity to mention that as of this day we have spent close to $150,000 in the equipment referred to in Exhibit 2 of the quotation with the intention of accommodating the properties exhibited by your ore. If you wish, we can send you the details in support of this expenditure. Please be informed that as of this date we have not received your coal.

Regards!

Albert Calderon

02/13/2007

AHMSA'S TEST PROGRAM — REVISED

February 13, 2007

Week 1 – Preliminary Investigative Tests as to compatibility of AHMSA's ore with AHMSA's coal

Number of tests: 3

Length of Tests: 12 hours each

PROCEDURE

- Prepare for tests #1, #2, and #3
- Run Test #1—Collect data and samples
- Make changes, if necessary
- Run Test #2—Collect data and samples
- Make changes, if necessary
- Run Test #3—Collect data and samples
- Analyze and document results
- Cleanup

Week 2 – Based on results from Week 1

Expand tests to 24 hours

Number of tests: 2

PROCEDURE

- Prepare for Tests #4 and #5
- Make changes, if necessary, from what was learned in Week 1 as part of preparation
- Run Test #4—Collect data and samples
- Make changes, if necessary
- Run Test #5—Collect data and samples
- Analyze and document results
- Cleanup

AHMSA'S TEST PROGRAM — REVISED (continued)

Week 3 – Based on results from Week 2
Expand length of Test to 48 hours
Number of tests: 1

PROCEDURE

- Prepare for Test #6
- Make changes, if necessary, from what was learned in Week 2 as part of preparation
- Run Test #6—Collect data and samples
- Analyze and document results
- Cleanup

Week 4 – Based on results from Week 3
Expand length of test to 72 hours
Number of tests: 1

PROCEDURE

- Prepare for Test #7
- Make changes, if necessary, from what was learned in Week 3
- Run Test #7—Collect data and samples
- Analyze and document results

Week 5 –

PROCEDURE

- Assemble material produced
- Melt a heat from material produced
- Package selected material for shipment to AHMSA
- Assemble data collected
- Write Report